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Composite Hydrogels for Use as Internal Curing Agents in Cementitious Materials

A new composite hydrogel internal curing agent integrates pozzolanic particles into its polymer network, offering easier handling and leading to stronger, more durable concrete with refined microstructure and reduced porosity.

High-performance concrete can prematurely dry out as it is setting and curing, resulting in incompletely cured concrete. To combat this problem, cement mixtures contain internal curing agents that are swollen with water. The water is subsequently released into the concrete during setting, enabling the hydration reaction with water. Silica fume is also typically added to cement mixtures as a way to encourage beneficial pozzolanic reactions within the concrete during curing.

Researchers at Purdue University have developed a new technology for hydrogel-based internal curing agents for use in concrete materials, including high-performance concrete applications. This technology creates a composite hydrogel internal curing agent in which siliceous, pozzolanic solid particles are directly integrated into the 3D polymer network through advanced surface-initiated synthesis techniques. The particles will remain in the presence of water to catalyze the hydration reaction, but now they will be much easier to handle and add to cement mixtures. The resulting concrete products have a significantly refined microstructure and reduced porosity, thus increasing both the strength and durability compared to currently used techniques.

Advantages:

-Produces stronger and more durable concrete products

-Concrete products with significantly refined microstructure and reduced porosity

-Direct integration of pozzolanic solid particles into the 3D polymer network

Potential Applications:

Technology ID
2015-ERK-67079

Category
Buildings, Infrastructure, & Construction/Structural Health Monitoring
Chemicals & Advanced Materials/Polymer Science & Smart Materials
Materials Science & Nanotechnology/Advanced Functional Materials

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-Concrete/Cement Industry

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